CALCULUS.

306. Proposed by FRANCIS RUST, C. E., Pittsburg, Pa.

Express in elliptic integrals: $A_\theta = \int_0^\theta \frac{dx}{\sqrt{(1-x^4)}}$; $0<\theta<0$.

307. Proposed by S. G. BARTON, Ph. D., Clarkson School of Technology.

The maximum value is not necessarily the greatest value of a function. Show why we take the maximum value as the greatest value in practical problems in maxima and minima. Likewise minimum for least value.

MECHANICS.

259. Proposed by J. SCHEFFER, A. M., Hagerstown, Md.

A uniform beam of the weight W, rests on a horizontal plane, and leans against a vertical wall, but so as *not* to lie in a vertical plane. Denoting the pressure upon the horizontal and vertical planes, respectively, by x and y, the coefficients of friction respectively, by μ and μ'; the angle which the perpendiculars from the foot of the beam upon the intersection of both planes makes with the beam by ϕ; the angle which this perpendicular makes with the direction of the friction peg by ξ; and the angle, which the projection of the beam upon the vertical wall makes with the vertical line, by ψ. To prove: $(1+\mu^2)\mu'^2\sin^4\psi-[1+\mu'^2+4\mu^2\mu'^2]\sin^2\psi+4\mu^2\mu'^2=0$; $\tan\xi=\mu'\cos\psi$, $\tan\phi=\mu'\cot\psi$, $x=\frac{\mu\cos\xi}{1+\mu\mu'\sin\psi\cos\xi}W$, $y=\frac{1}{1+\mu\mu'\sin\psi\cos\xi}W$.

NUMBER THEORY AND DIOPHANTINE ANALYSIS.

181. Proposed by V. M. SPURAR, M. and E. E., Chicago, Ill.

If $2n+1$ is an odd prime p, $(2n)!\equiv(-1)^n 2^{4n}(n!)^2 \pmod{p^2}$.

182. Proposed by V. M. SPUNAR, M. and E. E., Chicago, Ill.

Find two general solutions in integers of the equation $x^2=616318177y-1$.

148. Proposed by R. D. CARMICHAEL, Anniston, Ala.

Find all the multiply perfect numbers of n different prime factors and of multiplicity $n-1$.

153. Proposed by LLOYD HOLSINGER, A. B., 227 Fredonia Avenue, Peoria, Ill.

If we represent by (k, l) the greatest common divisor of k and l, and by $\phi(k)$ the number of integers prime to k and not greater than k, we have

$$\begin{vmatrix} (1,1) & (1,2) & (1,3) & \dots & (1,n) \\ (2,1) & (2,2) & (2,3) & \dots & (2,n) \\ \cdot & \cdot & \cdot & \cdot & \cdot \\ (n,1) & (n,2) & (n,3) & \dots & (n,n) \end{vmatrix} = \phi(1).\phi(2).\phi(3)\dots\phi(n).$$

157. Proposed by A. H. HOLMES, Brunswick, Maine.

Find integral values for m and n in $64m^2n^2(m^2-n^2)^2+(m^2+n^2)^4=\square$.